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A Comparison of Pollution Prevention (P2) Programs across the U.S.

A Thesis in Environmental Studies and Sustainability

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Abstract

Industrial pollution is a major environmental and human health concern that is regulated by the Environmental Protection Agency. The Toxics Release Inventory (TRI) was established under the Community Planning and Right-to-Know Act and mandates that industrial facilities report their emissions to the government in a database that is accessible by the public. To regulate these industrial emissions, national emissions and pollution prevention standards have been enforced, and states have developed supplemental forms of pollution prevention policy. Among these state policies are those that place regulations at the state level, facility level, or remain voluntary. This study aims to compare these forms of pollution prevention policy and their impact on the number of pollution prevention activities that a facility participates in and their associated emissions. I found that both pollution prevention actions and emissions decreased over time and that state legislation is associated with a significant decrease in both of these factors while voluntary and required facility policy were not. This study offers an important piece of guidance for states moving forward in pollution prevention policy. I suggest that states develop and implement emissions-reduction policy rather than allowing industrial facilities to maintain their autonomy.

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Chapter I: Introduction

Section 1.1: Purpose of Study

Nearly 30 years ago, Congress tasked the Environmental Protection Agency (EPA) to develop the Community Planning and Right-to-Know Act, which legislated tracking of industrial pollution, creating the Toxics Release Inventory (TRI).[1] Following the development of this program, additional programs were created to reduce the levels of toxic emissions released by these monitored industrial facilities. In addition to federal policies, many states have adopted their own policies to strengthen and enhance the minimum national requirements for reporting. Different states have taken different approaches to addressing the issue of pollution reduction through pollution prevention programs. Some states more strictly enforced the extent of pollution prevention activities or how they will accomplish them, while other programs offered a voluntary extension of national requirements. This study aims to examine the pollution prevention policies developed by different states to assess the relative effectiveness of different state strategies in pollution prevention measures taken in the United States. It examines the influence of three kinds of pollution prevention policy on both the average number of pollution prevention activities undertaken by a facility and the average quantity of emissions released by a facility.

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[1] Hamilton, J. (2005, August 29). *Regulation through revelation: the origin, politics, and impacts of the Toxics Release Inventory Program*. Cambridge University Press.

Section 1.2: History of the Toxics Release Inventory

The Environmental Protection Agency (EPA) was established on December 2, 1970 by the Nixon administration to "establish and enforce environmental protection standards, conduct environmental research, provide assistance to others combating environmental pollution, and assist the CEQ [Council on Environmental Quality] in developing and recommending to the President new policies for environmental protection."[2] Since its inception, the EPA has been dealt a broadening range of authority through a series of influential environmental policies, including the Clean Air Act of 1970, Clean Water Act of 1972, and Safe Drinking Water Act of 1974. The Clean Air Act of 1970 required the EPA to address toxic air pollution as related to human health, acid rain, pollutants affecting the stratospheric ozone layer, and pollution affecting visibility.[3] Under jurisdiction of the Clean Air Act, the EPA established national air quality standards for the regulation of six major priority pollutants, including sulfur oxides, particulate matter, carbon monoxide, photochemical oxidants, nitrogen oxides, and hydrocarbons in 1971.[4] This act set a precedent for lists of other priority pollutants to be regulated later.

Following the regulation of air pollutants, the EPA focused its newly established regulations on water pollution. The Clean Water Act was enacted in 1972 to set point

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[2] Lewis, Jack. "Birth of EPA, The." *EPA J.* 11 (1985): 6.
[3] "Clean Air Act Requirements and History | Overview of the ..." 2015. 25 Mar. 2016 <https://www.epa.gov/clean-air-act-overview/clean-air-act-requirements-and-history>
[4] "EPA Sets National Air Quality Standards | About EPA | US EPA." 2015. 25 Mar. 2016 <https://www.epa.gov/aboutepa/epa-sets-national-air-quality-standards>

source wastewater discharge standards for industry through permitting standards.[5] This was followed by the Safe Drinking Water Act in 1974 which set standards for drinking water that may contain contaminants that have adverse effects on public health.[6]

A major policy established by the EPA in 1980 is the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), known as the Superfund Act. This Act taxed industrial chemical facilities in order to fund response by the government to clean up hazardous chemical releases that threaten public health.[7] The Superfund Act was inspired in part by Love Canal, one of the most infamous scandals and powerful movements seen by US environmentalism. In a "movement of housewives,"[8] grassroots activism took place in Niagara Falls, New York after local families discovered that their children's school and playground were built on a bed of toxic chemicals dumped by Hooker Chemicals and Plastics Corporation (now Occidental Chemical Corporation) which may have contributed to their children's many illnesses.[9] Following the law's passing, Love Canal was one of the first sites to be remediated under the jurisdiction of the Superfund Act.[10]

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[5] "Clean Water Act - US Senate Committee on Environment ..." 2005. 25 Mar. 2016 <http://www.epw.senate.gov/water.pdf>

[6] "Safe Drinking Water [Public Health Service Act] - US Senate ..." 2005. 25 Mar. 2016 <http://www.epw.senate.gov/sdwa.pdf>

[7] (2015). Superfund: CERCLA Overview | Superfund | US EPA. Retrieved January 11, 2016, from http://www.epa.gov/superfund/superfund-cercla-overview.

[8] Gottlieb, R. (2005, June 20). *Forcing the spring: The transformation of the American environmental movement*. Island Press.

[9] McKibben, B. (2008). *American earth: Environmental writing since Thoreau*.

[10] (2008). Love Canal - Superfund Site Profile | Superfund Site ... Retrieved January 11, 2016, from http://www.epa.gov/region02/superfund/npl/lovecanal/.

In 1986, major revisions were made to the Superfund Act in the Superfund Amendments and Reauthorization Act (SARA) to increase the size of the Superfund itself and make adaptations based on the EPA's experience with the program. It increased the size of the fund to $8.5 billion and increased community involvement in the decisions regarding cleanup of Superfund sites, especially in increasing its focus on the health hazards faced by these community members living near Superfund sites.[11] These revisions were primarily in response to two major catastrophes in Bhopal, India and in West Virginia where toxic chemical accidents killed many people.[12]

In 1984, a gas leak containing methyl isocyanate, an acutely toxic chemical, leaked from a Union Carbide plant in Bhopal, India, killing thousands. In a meta-analysis of the resulting health crisis, it was found that victims exposed to the chemical experienced ocular and respiratory symptoms with many later dying from complications from the resulting chronic inflammation.[13] In the following year, Union Carbide saw another industrial chemical leak in its West Virginia plant. While the West Virginia leak did not receive as much attention as the Bhopal leak, the leaks together influenced the revisions made to SARA.

SARA Title III created the Emergency Planning and Community Right-to-Know Act (EPCRA) and increased state involvement by requiring them to enforce toxic

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[11] (2015). The Superfund Amendments and Reauthorization Act (SARA). Retrieved January 11, 2016, from http://www.epa.gov/superfund/superfund-amendments-and-reauthorization-act-sara.

[12] "Learn about the Toxics Release Inventory | Toxics Release ..." 2015. 19 Feb. 2016 <http://www.epa.gov/toxics-release-inventory-tri-program/learn-about-toxics-release-inventory>

[13] Dhara, V Ramana, and Rosaline Dhara. "The Union Carbide disaster in Bhopal: a review of health effects." *Archives of Environmental Health: An International Journal* 57.5 (2002): 391-404.

chemical release reporting and to create emergency plans in the case of a toxic spill.[14] In 1988, a list of 296 core chemicals[15] was developed by the EPA; the release of these chemicals were required in facilities' reports to the EPA. Since the development of this initial list, additional core chemicals[16] were added due to their carcinogenic or other long-term health effects, increasing the list's length to 624 chemicals. These chemicals were added through petitioning by interest groups as outlined by the original 1986 Act.[17]

The EPA's Toxics Release Inventory (TRI) was established in 1986 under the EPCRA. This Act required facilities meeting the Act's requirements to report toxic TRI-registered chemicals released that are produced or are otherwise used in processing to the EPA.[18] Industrial facilities required to report to the TRI are those in TRI-covered industries (mining, utilities, manufacturing, publishing, hazardous waste, merchant wholesalers, and wholesale electronics), which employ 10 or more full-time employees, and that use one or more TRI-listed chemicals, such as those included in the core chemicals lists.[19] Since its inception, facilities have been reporting their toxic emissions to the TRI annually; these reports have been filed in EPA databases and the emissions data is available to the public. This unprecedented access has allowed for greater

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[14] (2008). IDHS: What is SARA Title III? - IN.gov. Retrieved January 11, 2016, from http://www.in.gov/dhs/2526.htm.

[15] See Appendix A for 1988 Core Chemicals, pg 35

[16] See Appendix B for 2011 Core Chemicals, pg 42

[17] Hamilton, J. (2005, August 29). *Regulation through revelation: the origin, politics, and impacts of the Toxics Release Inventory Program*. Cambridge University Press.

[18] (2015). U.S.C. Title 42 - THE PUBLIC HEALTH AND WELFARE. Retrieved January 11, 2016, from https://www.gpo.gov/fdsys/pkg/USCODE-2011-title42/html/USCODE-2011-title42-chap116.htm.

[19] "Basics of TRI Reporting | Toxics Release Inventory (TRI ..." 2015. 25 Mar. 2016 <https://www.epa.gov/toxics-release-inventory-tri-program/basics-tri-reporting>

understanding of the magnitude of toxic chemicals being released into the nation's air, water, and soils annually.

Section 1.3: Major Vessels of Pollution

Pollution is released into the environment through three primary media: water, land, and air. Land and air pollution are primarily released as point source pollution while water pollution is primarily released as non-point source pollution.

According to the EPA, point source pollution includes "any discernable, confined and concrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged."[20] Non-point source pollution includes any pollution not included in point source pollution. It often takes the form of runoff from agriculture or urban pollution or seepage from landfills. Non-point source pollution is attributed to a majority of water quality issues although it is difficult to quantify the pollution to verify this concern.[21] It is difficult to regulate non-point sources of pollution, but point sources, such as those contributed by industry, are regulated by the EPA under the Clean Water Act, Safe Drinking Water Act, and the Clean Air Act.

A major contributor to groundwater pollution is hazardous waste sites. This form of ground pollution leaches into groundwater systems, creating an environmental and

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[20] "What is Nonpoint Source? | Polluted Runoff: Nonpoint ..." 2015. 24 Mar. 2016 <https://www.epa.gov/polluted-runoff-nonpoint-source-pollution/what-nonpoint-source>

[21] "What is Nonpoint Source? | Polluted Runoff: Nonpoint ..." 2015. 24 Mar. 2016 <https://www.epa.gov/polluted-runoff-nonpoint-source-pollution/what-nonpoint-source>

public health issue. A well-known example of hazardous waste sites affecting local groundwater supply is the effects of an illegal dumping site in Toms River, NJ. In his book *Toms River: A Story of Science and Salvation*, Dan Fagin chronicles the human and environmental impacts of the illegal toxic waste dumping done by Union Carbide in 1971.[22] Over a period of five months, over 5,000 toxic waste drums containing flammable and explosive chemicals were illegally dumped on Reich Farm in Toms River, NJ (then Dover Township). The most visible of these drums were removed by Union Carbide and the rest were plowed over and buried, allowing their chemicals to leach into the surrounding groundwater. When a subsequent pediatric cancer cluster was investigated in 1999, it was determined that there were traces of chemicals from the dumped drums in local well water, but a connection to the cancer cluster could not be determined.[23]

In addition to land and water, the air is a considerable channel for pollution. While industrial air pollution is monitored and regulated, vehicular pollution provides a substantial contribution to air pollution. In her 2013 honors thesis[24], Brianne Flynn examined air pollution hot spots associated with the Ironbound section of Newark, New Jersey. She concluded that the number of diesel vehicles in an area does not necessarily correlate with the average particulate concentrations in the air, but a passing diesel vehicle correlates with changes in the particulate matter creating temporary, localized

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[22] Fagin, Dan. *Toms River: a story of science and salvation*. Bantam, 2013.
[23] Richardson, Susan D et al. "Identification of drinking water contaminants in the course of a childhood cancer investigation in Toms River, New Jersey." *Journal of Exposure Analysis & Environmental Epidemiology* 9.3 (1999).
[24] Flynn, Brianne. "Identifying and analyzing air pollution hot spots from diesel vehicles in the Ironbound section of Newark, New Jersey," honors thesis, Drew University, New Jersey, 2013.

spikes in the particulate levels. Like industrial pollution, vehicular air pollution can be a threat to public health and is a contentious environmental justice issue.

These three primary media for pollution are major threats to public and environmental health. Case studies, such as in Toms River, NJ, provide tangible evidence for the importance of monitoring and regulating environmental pollution to advance both human and environmental health. This study aims to contribute to the political conversation and make recommendations for industrial environmental policy.

Section 1.4: History of Pollution Prevention

The Pollution Prevention Act of 1990 extended TRI reporting requirements to also collect information on the participation in the industrial pollution prevention (P2) programs. This law created a national policy to prevent pollution at its source whenever feasible. It defines source reduction as "any practice which reduces the amount of hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal; and reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants."[11]

In 1991, the EPA released the first voluntary P2 program nationwide. The 33/50 Program, as it came to be called, aimed to reduce releases of 17 determined toxic chemicals by 33% by 1992 and 50% by 1995.[25] This program was initially thought to be

[25] "EPA's 33/50 Program Company Profile: Johnson & Johnson." 2013. 11 Jan. 2016 <http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=91013VLO.TXT>

successful in significantly decreasing target chemical emissions and saw its 50% goal reached in 1994.[26] However, in a 2007 study, Vidovic and Khanna found that the 33/50 Program itself had no significant impact on target emissions and that any decline in emissions was likely due to an independent trend that began before the 1991 program. Many of the significant polluters participating in the program saw a decline in their emissions in the years prior to the 33/50 Program's inception and were able to include part of the decline seen prior to their participation to their reduction goal. Vidovic and Khanna propose that the use of the cleaner waste management programs put into place before 1991 contributed to that decline and the continuing decline recorded during the 33/50 Program's lifetime.[27]

To further its voluntary nationwide P2 programs, the EPA reimagined environmental policy with its Common Sense Initiative in 1994. This initiative brought together 6 top-polluting industries with environmentalist leaders to encourage discussion between the two sectors on developing cleaner and smarter ways to reduce pollution through consensus. The plan was met largely with failure when major industrial industries withdrew from the initiative because they felt that such discussions were better suited for smaller businesses.[28]

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[26] Khanna, Madhu, and Lisa A. Damon. "EPA's voluntary 33/50 program: Impact on toxic releases and economic performance of firms." *Journal of environmental economics and management* 37.1 (1999): 1-25.
[27] Vidovic, Martina, and Neha Khanna. "Can voluntary pollution prevention programs fulfill their promises? Further evidence from the EPA's 33/50 Program." *Journal of Environmental Economics and Management* 53.2 (2007): 180-195.
[28] LeClair, Vincent. "" Common Sense" reform initiatives falters." *Environmental science & technology* 31.5 (1997): 222A-223A.

While the national legislation promotes source reduction practices "whenever feasible,"[29] and national voluntary programs were not hugely successful, individual states have developed additional policies varying in scope to encourage or require and provide support for facilities implementing P2 measures. It has been found that implementation of P2 measures is higher among facilities within states that have developed P2 legislation.[30]

Section 1.5: Experimental Hypothesis

I hypothesize that required facility pollution prevention policy will have the greatest impact on pollution prevention activities and emissions because it directly regulates the facilities participating in pollution prevention and releasing emissions. It is additionally hypothesized that pollution prevention activities will be associated with a reduction in emissions releases.

[29] EPA. 1990. Pollution Prevention Act of 1990. [Internet]. [31 Dec 2002, cited 11 May 2015]. Available from: http://www.epw.senate.gov/PPA90.pdf.

[30] Harrington DR. 2013. Effectiveness of state pollution prevention programs and policies. Contemporary Economic Policy 31(2): 255-278.

Chapter II: Methods

This section summarizes the methods used to obtain state pollution prevention policy data and describes how these state policies were split into three broader categories. I provide samples of each of these policy categories and describe how I obtained annual emissions data for each state, the limitations of the data sources, and the statistical tests run to analyze the data.

Section 2.1: State Pollution Prevention Policy

State Pollution Prevention policy was obtained through the Interstate Chemicals Clearinghouse U.S. State Chemicals Database,[31] a database concerning all state chemical policy. A query was set up in the database to create parameters for the search (Table 1).

Table 1: Query for state P2 policy

Variable	Value
State	All
Region	All
Status	All
Chemical	All
Policy Category	Pollution Prevention
Product Types	All
Year	All

Once P2 policy was obtained for each state, the states were categorized according to the type of P2 policy that they had in place (Table 2; Figure 1). To accomplish this, 92 different pieces of legislation were coded for the 39 states included in the database to

[31] "IC2 - Chemicals Policy." 2014. 15 Jan. 2016 <http://theic2.org/chemical-policy>

determine patterns among them. Not all states are included in this analysis because P2 policy information was unavailable for some states in the Interstate Chemicals Clearinghouse; P2 policy information for Ohio was obtained through personal correspondence with Michael Kelley of the Ohio EPA. It was determined that there were distinct differences in the legislation in regards to who the legislation was governing.

Three policy types emerged from the analysis of existing state legislation: voluntary policy, required state agency policy, and required facility policy. Policies were coded as voluntary if they encouraged state agencies and facilities to participate in P2 actions but were entirely voluntary and did not contain any requirements concerning P2. Policies were coded as required state agency policy if they placed a requirement on state agencies to develop P2 programs but did not directly include requirements to be met by industrial facilities. They can be considered management-based regulations, defined as "neither explicitly impos[ing] the means, nor the ends. Rather, what is required is that each regulated entity review its production goals and procedures that will reduce risk."[32] Policies were coded as required facility policy if they placed requirements directly on industrial facilities to participate in general or specific P2 activities. Some examples of these three policy categories include P2 policy developed by Colorado (voluntary), Hawaii (required state agency policy), and Ohio (required facility policy).

[32] Bennear, Lori Snyder. "Are management based regulations effective? Evidence from state pollution prevention programs." *Journal of Policy Analysis and Management* 26.2 (2007): 327-348.

Table 2: State policy categories

Voluntary Policy	Required State Agency Policy	Required Facility Policy
Alaska	Hawaii	Arizona
Colorado	Iowa	California
Connecticut	Massachusetts	Florida
Delaware	Michigan	Georgia
Illinois	New Hampshire	Louisiana
Indiana	New Mexico	Maine
Kentucky	Oklahoma	Minnesota
Nebraska	Oregon	Mississippi
North Carolina	South Dakota	New Jersey
Pennsylvania	Vermont	New York
South Carolina	West Virginia	Ohio
Virginia	Wisconsin	Rhode Island
Washington		Tennessee
		Texas

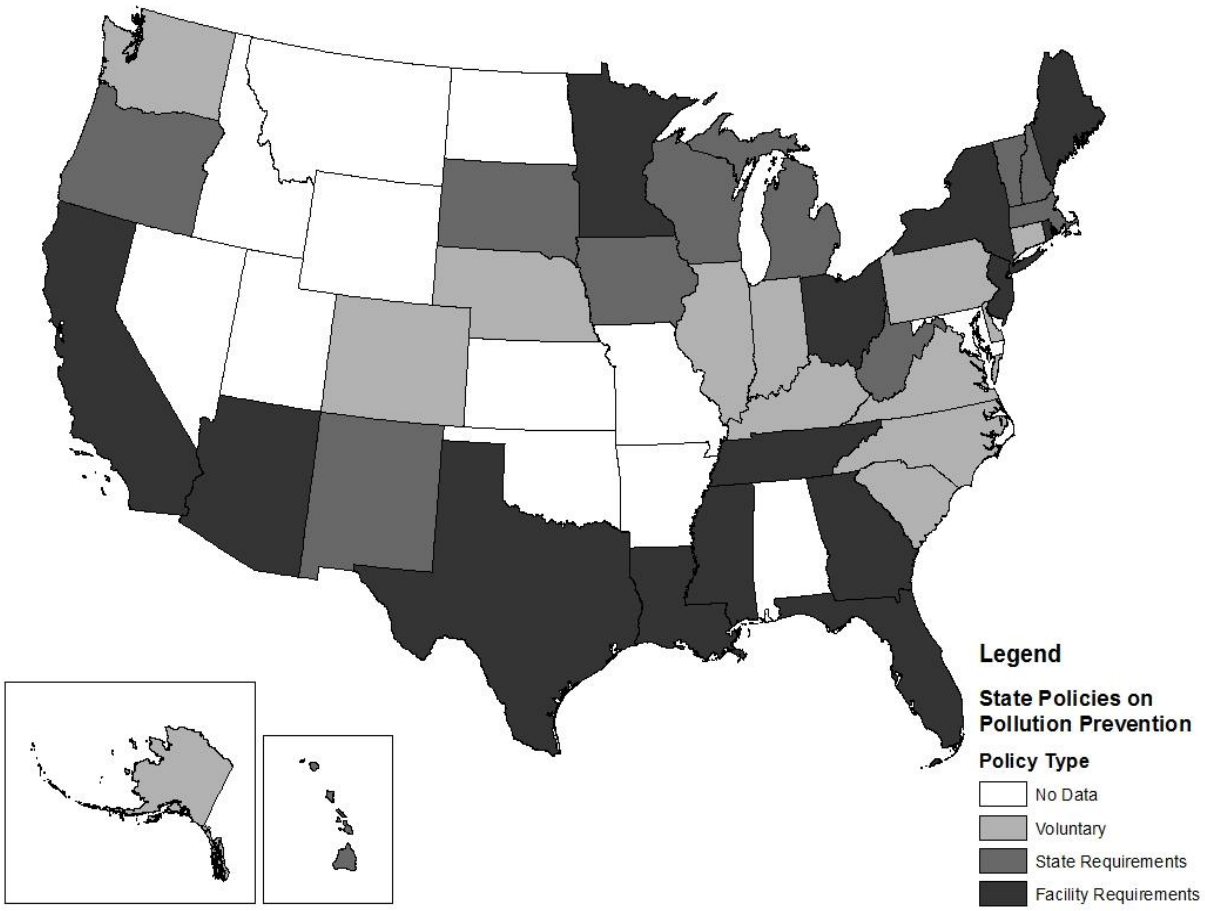

Figure 1: State policies on pollution prevention in the United States

Section 2.1A: Sample Voluntary Policy

Colorado's pollution prevention policy includes a voluntary program that provides technical assistance to facilities interested in pursuing P2 activities. It was developed from the Colorado Pollution Prevention Act of 1992, which established that pollution prevention should be the management tool of choice. The state supplements this program with the Governor's Pollution Prevention Challenge Program to incentivize pollution prevention. In 2000, the program included 22 participants, 8 of which that were able to reduce their toxic emissions by over 1,000,000 pounds per year.[33]

Section 2.1B: Sample Required State Agency Policy

In Hawaii, pollution prevention policy has established a hazardous waste management program through the Solid and Hazardous Waste Branch. This policy gives the Branch's director the power to "make, amend, and appeal state rules"[34] concerning hazardous waste and its pollution. This program qualifies as a form of state agency policy because it gives power to the state when managing its pollution prevention policy and does not give any specific guidelines for individual facilities to follow.

Section 2.1C: Sample Required Facility Policy

Pollution prevention programming in Ohio has expanded upon national standards to include Supplemental Environmental Projects (SEPs) in enforcement settlements with

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[33] "Colorado Governors Pollution Prevention Challenge ..." 2012. 19 Feb. 2016 <http://infohouse.p2ric.org/ref/16/15282.pdf>

[34] "Chapter 342J - Chemicals Policy & Science Initiative." 2011. 15 Jan. 2016 <http://www.chemicalspolicy.org/legislationdocs/Hawaii/HI_342J.doc>

facilities that do not meet emissions standards. The inclusion of these programs qualifies Ohio's policy as a required facility policy because they place requirements on the individual facilities within the state. Supplemental Environmental Projects are defined by the EPA as having three characteristics: (1) being "environmentally beneficial," occurring "in settlement of an enforcement action," and being "not otherwise legally required to perform."[35] The policy of including SEPs was introduced by the EPA in 1991 as an alternative penalty for facilities that do not meet standards but who will show a future commitment to maintaining environmental health.[36] The purpose of including SEPs in settlement cases is to promote environmental and public health beyond what is required in compliance to the emissions standards.[37] This EPA policy was updated in 2015 to include the types of projects that could be considered SEPs, including public health initiatives, pollution prevention and reduction, restoration activities, compliance promotion, and emergency planning.[38]

Ohio's Office of Pollution Prevention (OPP) has been participating in SEP enforcement settlements since 1991 with 145 settlements including the policy.[39] These SEPs are categorized as P2 Projects, P2 Programs, or third party projects.[40] Facilities are

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[35] "Memorandum - Environmental Protection Agency." 2015. 15 Jan. 2016 <http://www.epa.gov/sites/production/files/2015-04/documents/sepupdatedpolicy15.pdf>
[36] "Pollution Prevention in Ohio's Environmental Enforcement ..." 2009. 15 Jan. 2016 <http://www.epa.ohio.gov/portals/41/p2/p2regint/enforce2.pdf>
[37] "Memorandum - Environmental Protection Agency." 2015. 15 Jan. 2016 <http://www.epa.gov/sites/production/files/2015-04/documents/sepupdatedpolicy15.pdf>
[38] "Memorandum- Environmental Protection Agency." 2015. 15 Jan. 2016 <http://www.epa.gov/sites/production/files/2015-04/documents/sepupdatedpolicy15.pdf>
[39] Michael Kelley, Ohio EPA, personal correspondence
[40] "Pollution Prevention Supplemental Environmental Projects." 2009. 15 Jan. 2016 <http://wwwapp.epa.ohio.gov/opp/p2regint/p2sep1.html>

considered a good candidate for SEP enforcement settlements if their violations can be improved by P2 programs, specific P2 projects can be identified, they have the funds to implement a project, and have an interest in participating.[41] How the facilities meet these requirements determines their candidacy for different SEP enforcement settlements.

P2 Projects are specific actions that address the reduction or overall elimination of waste production and emissions and include projects that improve the environmental impact of technology or equipment used, substitute or reduce the use of toxic materials, and promote conservation focusing on the impacts of pollution.[42] An example of a successful project is the enforcement settled by the Ohio EPA and the Columbus Steel Drum Company in October 1993.[43] The Columbus Steel Drum Company was cited for hazardous waste management violations and agreed to install a pretreatment system for their drum painting machinery, which would minimize the waste created by painting the steel drums by reusing contaminated water. This improvement of the technology they were using and overall reduction in hazardous material use qualified them for an SEP settlement.

P2 Programs are a formal SEP that include developing a P2 team that will assess opportunities for cost effective measures that can reduce toxic pollution production.[44] In Ohio, a facility that utilized a P2 Program as a part of their settlement deal is Cross Pointe Paper. The paper manufacturer was cited for wastewater discharge violations and

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[41] "Pollution Prevention in Ohio's Environmental Enforcement ..." 2009. 15 Jan. 2016 <http://www.epa.ohio.gov/portals/41/p2/p2regint/enforce2.pdf>
[42] Michael Kelley, Ohio EPA, personal correspondence
[43] Document from Michael Kelley
[44] Michael Kelley, Ohio EPA, personal correspondence

developed a P2 Program improving operations and setting a schedule for a series of reports documenting the progress of the program.[45]

Third party projects are funded by the facilities involved in the enforcement settlement but are implemented by third party groups such as a non-profit organization or university.[46] For example, in July 1993, ETS Transportation Services reached a settlement with the Ohio EPA for violating hazardous waste management regulations. In the settlement, the transportation company agreed to pay $32,000 to the Northeast Industrial Waste Exchange, an organization that helps companies reuse materials containing hazardous waste.[47] While ETS Transportation Services did not engage in their own P2 activities, providing the funding for another organization to help others participate, qualified them for an SEP settlement and a penalty reduction. Other third party projects may include donations to a local conservation project or providing funding for local small businesses to conduct their own P2 assessments.

Section 2.2: Pollution Prevention Action and Emissions Data

The TRI.NET tool was used to collect data on P2 source reduction measures being taken by industrial facilities and on the chemical emissions being released by these industrial facilities. This tool allows users to create queries based on specific variables collected by the Toxics Release Inventory. These queries are built by sifting through a series of folders containing grouping variables, data variables, and filtering variables to

[45] Document from Michael Kelley
[46] Michael Kelley, Ohio EPA, personal correspondence
[47] Document from Michael Kelley

specify the query (Table 3). In this study, only the 1988 core chemicals were used to standardize the emissions data over time. P2 actions were measured by the number of 8.10 source reduction activities[48] being taken by a facility. These activities include actions "implemented to reduce or eliminate quantities" of target chemicals but "do not include recycling, treating, using for energy recovery, or disposing of an EPCRA Section 313 chemical," which, much like the core chemicals, change each year. Three-digit codes are provided on TRI forms to help facilities determine which 8.10 source reduction activities that they have taken.[49]

Table 3: Query for P2 actions and emissions data

Grouping Variables	Data Variables	Filtering Variables
State	Counts- facility count	Chemical Group- 1988 core chemicals
Year	P2 Counts- all	Industry- all
	Releases- all	Facility
		Geography- all
		Year- all
		Pollution Prevention- all

Grouping variables are the largest of the hierarchical variable folders in TRI.NET. They are used to determine how the data variables will be organized in the output. Data variables are the variables that are presented in the data output. Filtering variables restrict the data variables to narrow down the information that is presented. In this study,

[48] See Appendix C for TRI form, pg 57

[49] "4.1.5.3 Source Reduction (Part II, Sections 8.10 and 8.11 of ..." 2015. 26 Mar. 2016 <http://www3.epa.gov/twebhelp/WebHelp/4_1_5_3_source_reduction_part_ii_sections_8_10_and_8_11_of_form_r__2.htm>

1988 core chemicals are selected as the chemical group to standardize the results among the years. Therefore, quantity of releases by facility only includes the 296 1988 core chemicals, which have been consistently reported to the EPA throughout the entire time period.

Section 2.3: Data Limitations

While TRI.NET is an incredibly helpful tool in determining emissions and source reduction activities, there are limits to the data due to the strict guidelines established in the TRI. Because facilities have to meet the three major requirements, such as employing 10 or more full-time employees, to report to the TRI, there are facilities that may be major contributing sources of pollution that are not being monitored under the program. There is also a section of practices outside the EPA's definition of source reduction under the Pollution Prevention Act; recycling, energy recovery, treatment, and disposal are not included within the definition of pollution prevention and are therefore not considered 8.10 source reduction activities.[50] These actions may have an impact on both the emissions that a facility is producing and the environmental impact of its emissions but are not being taken into consideration.

Additionally, the EPA is working to phase out the use of TRI.NET as a tool to sort and analyze TRI data in order to make way for an application that will update more

[50] "4.1.5.3 Source Reduction (Part II, Sections 8.10 and 8.11 of ..." 2015. 26 Mar. 2016 <http://www3.epa.gov/twebhelp/WebHelp/4_1_5_3_source_reduction_part_ii_sections_8_10_and_8_11_of_form_r__2.htm>

quickly and provide visual representations of the data.[51] It will be replaced with TRI Analyzer, an application that has not been released yet. Unfortunately, TRI.NET is beginning to be phased out before TRI Analyzer will be put into place, so the data that TRI.NET provides will not include further data.

Section 2.4: Statistics

A multiple regression was run using SPSS statistical software to determine the association between the average number of P2 actions taken by a facility and the type of P2 policy, average amount of emissions per facility, and year. Dummy coding was used to create two variables that described the type of P2 policy governing a facility. Voluntary policies were used as a reference group to which both required state agency policy and required facility policy data points could be compared in these variables. Both variables were included in the multiple regression.

A fixed effects model was used to determine the association between the average amount of emissions discharged by a facility and the average number of P2 actions taken by a facility, the type of P2 policy, year, lagged average amount of emissions per facility, and fixed effects for state. The variable describing the lagged average amount of emissions per facility created a lag by one year to account for the previous year's emissions having some effect on a case's average emissions per facility. The fixed effects accounted for the relatedness between observations from the same state. For

[51] "TRI.NET | Toxics Release Inventory (TRI) Program | US EPA." 2015. 23 Mar. 2016 <https://www.epa.gov/toxics-release-inventory-tri-program/trinet>

example, the observations for New Jersey are more likely to be related than between New Jersey and other states thereby making the observations not independent.

The dependent variables measuring the average number of P2 action per facility and the average amount of emissions per facility used in this study are not truly dependent or independent because there were included as independent variables for each other in their respective regressions. Because of this, a path analysis or a two-staged least squares approach might be considered in future analysis.

Chapter III: Results

Section 3.1: Summary Measures

There has been a decline in both P2 activities and number of facilities in each state between 1988 and 2013 (Figures 2 and 3). Each year is associated with 22 fewer P2 activities per state on average (Figure 2). The average number of P2 activities per state over this time period was 340. The average number of P2 activities per facility was 3.33 per year. The maximum reported number of P2 activities that were performed was in California in 1991 (2,768) and the minimum reported number of P2 activities that were performed was in Alaska in 2006 and 2007 (0). The average number of industrial facilities per state was 99. The largest number of industrial facilities was recorded in California in 1991 (704) and the smallest number of facilities was found in North Carolina in 2006 (100). The average annual amount of emissions discharged per state was 9.8 million pounds. Each year is associated with an approximately 290,000 lb decrease in emissions (Figure 4a). The greatest amount of emissions discharged was located in Alaska in 2013 (537,642,950.3 lbs) (Figure 4b) and the least amount of emissions discharged was in Illinois in 1988 and in Maine 1989 and 1990 (0). These two states in these years had one TRI-reporting facility that did not report any emissions. The high emissions report for Alaska may have been a misreport that included multiple entries that should have been separated. When Alaska was removed as an outlier, the overall average emissions discharged per year increases to approximately 650,000 lbs (Figure 4b).

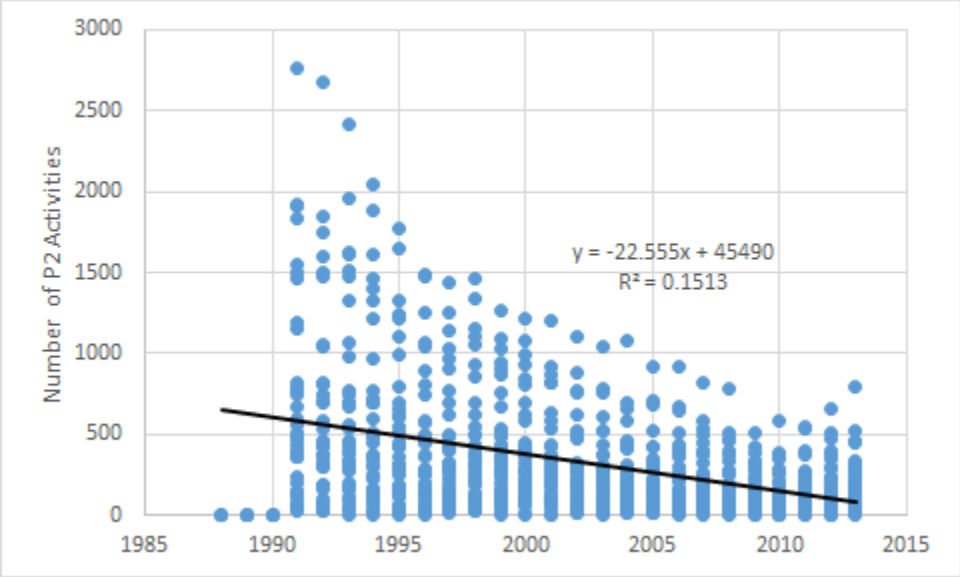

Figure 2: The number of P2 activities exhibited by states 1988-2013

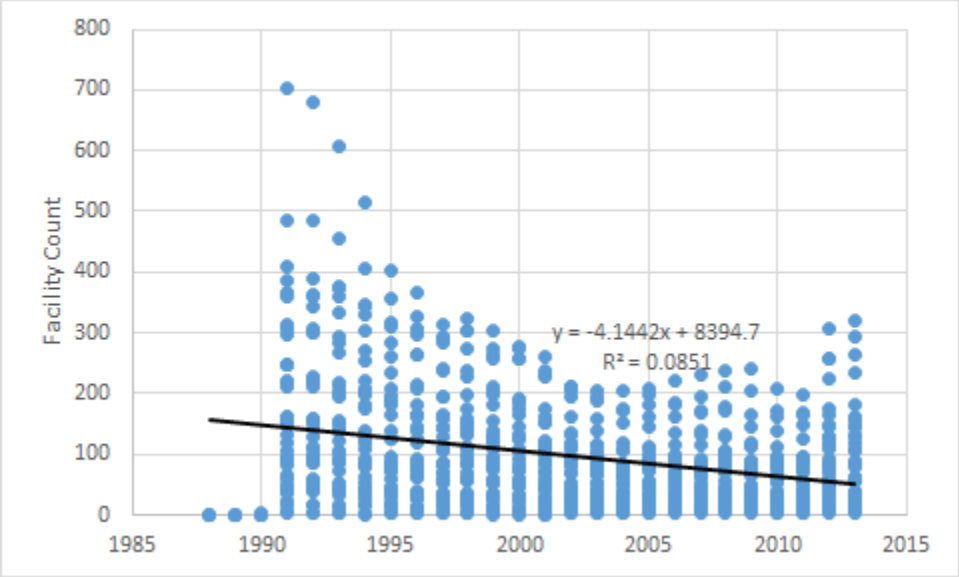

Figure 3: The number of facilities in states 1988-2013

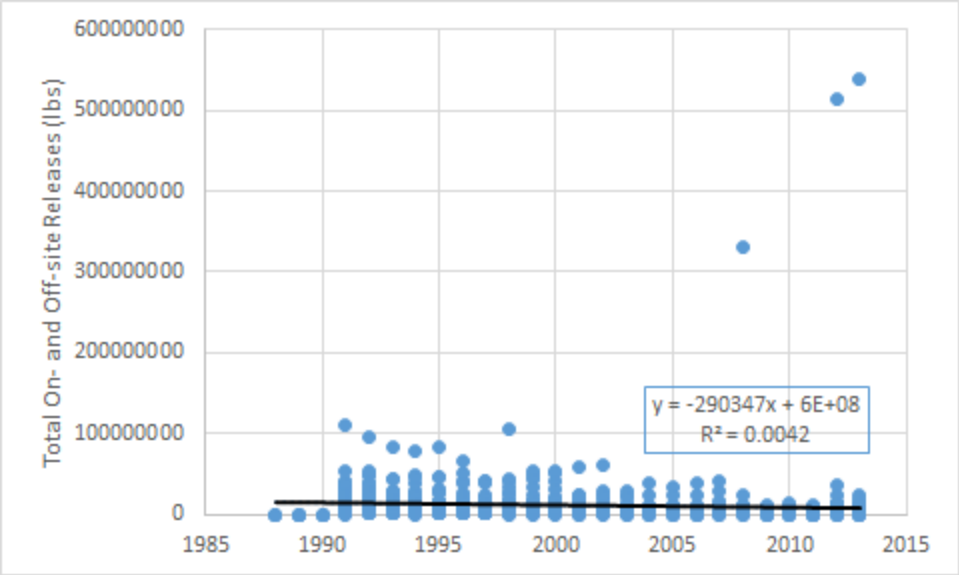

Figure 4a: The quantity of 1988 core chemical emissions in 1988-2013

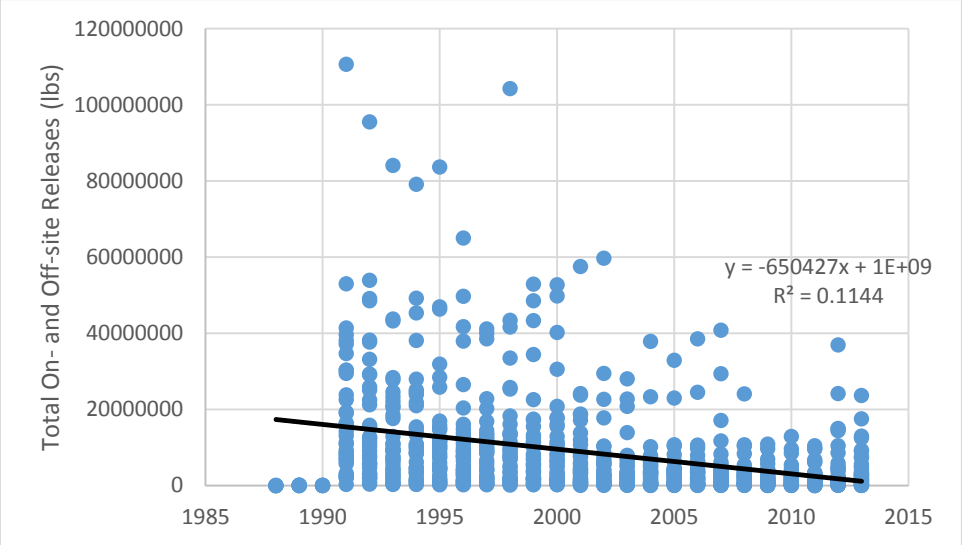

Figure 4b: The quantity of 1988 core chemical emissions 1988-2013, excluding Alaska

Section 3.2: P2 Actions as a Function of Policy, Emissions, and Year

After creating a statistically significant regression model $F(4, 838) = 37.96$, $p < .0001$, approximately 15.3% of the variance in the average number of P2 actions taken by a facility can be explained by the type of P2 policy, the average amount of emissions per facility, and the year. Holding all other variables constant, required state policy is associated with a 0.58 increase in the average number of P2 actions taken by a facility compared with states with voluntary policy, $b = .58$, $t(838) = 4.08$, $p < .0001$ (Table 4). Controlling for other factors, there was no significant impact of required facility policy on the average number of P2 actions taken by a facility, $b = .01$, $t(838) = .09$, $p = .925$, and there was no significant impact seen by the average amount of emissions released by each facility, $b > -.0001$, $t(838) = -.53$, $p = .597$ (Table 4). Holding all other variables constant, a one year increase is associated with a .09 decrease in the average number of P2 actions taken by a facility, $b = -.09$, $t(838) = -11.53$, $p < .0001$ (Table 4). I include a map showing the distribution of P2 actions across states in Figure 5.

Table 4: Coefficient values for multiple regression predicting average P2 activities

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	186.766	16.171		11.549	.000
	statereq	.583	.143	.147	4.076	.000
	facreq	.012	.127	.003	.094	.925
	emmfac	-3.936E-9	.000	-.017	-.528	.597
	Year	-.092	.008	-.362	-11.353	.000

a. Dependent Variable: P2fac

Figure 5: The number of P2 policies in each state in 2010

Section 3.3: Emissions as a Function of Policy, P2 Actions, and Fixed Effects

After creating a statistically significant fixed effects regression model $F(38,768) = 3.64$, $p < .0001$, 15.3% of the variance in the average emissions discharged by a facility can be explained by the type of P2 policy, year, the average number of P2 actions per facility, and the fixed effects. Because this model showed the same low influence on the average number of P2 actions taken by a facility as the multivariate regression model, Alaska, an outlier, was taken out of the model. Alaska had the greatest amount of emissions discharged (537,642,950.3 lbs) which was almost 55 times the average amount emissions discharged (9,833,075.42 lbs). In addition to having the greatest amount of emissions discharged, Alaska in 1998-2001 had very low discharge levels (443 lbs, 824 lbs, 646 lbs, respectively). Given these low values, it therefore seems unlikely that they would have over 500,000,000 lbs emissions just a few years later.

The resulting fixed effects regression model had a higher statistically significant variance explanation at 56.2%, $F(37, 742) = 25.71$, $p < .0001$. Holding all other variables constant, required state policy is associated with a 108,092.7 pound decrease in the average emissions discharged by a facility compared to states with a voluntary policy, $b = -108092.7$, $t(742) = -3.84$, $p < .0001$, and required facility policy is associated with a 112,434.2 pound increase in the average emissions discharged by a facility compared to states with voluntary policy, $b = 112434.2$, $t(742) = 4.65$, $p < .001$. There was no significant impact of the average number of P2 actions taken by a facility on the average amount of emissions discharged by a facility, $b = 4869.17$, $t(1742) = 1.77$, $p = .078$. Holding all other variables constant, a one year increase is associated with a 1,473.21

pound decrease in the average amount of emissions discharged by a facility, b = -1473.2, $t(742) = -2.84$, $p < .05$. I include a map of the distribution of the amount of emissions discharged by each state in Figure 6.

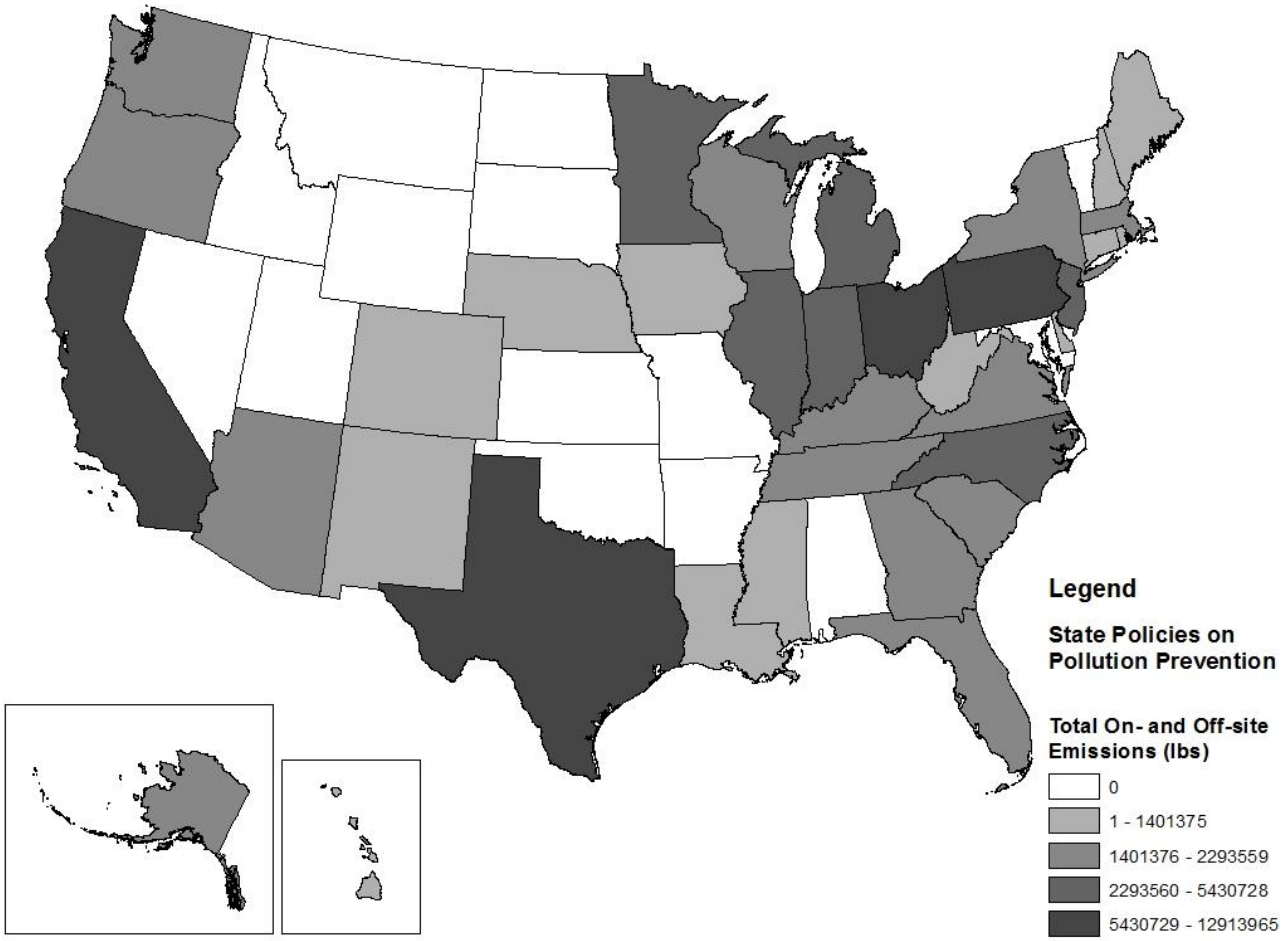

Figure 6: The amount of emissions discharged in each state in 2010

Chapter IV: Conclusions

Section 4.1: Discussion of Results

While it was hypothesized that facility P2 policy would be associated with an increase in P2 actions and that the implementation of P2 actions would be associated with a decrease in emissions, neither hypothesis was supported by this study. Over time, there is a significant decrease in both P2 actions and emissions discharges. This is likely due to long-term P2 actions being put into place that may have influenced the decrease in discharges over time but were only counted as a P2 action once. This is similar to, but in the opposite direction of, the phenomenon shown by Vidovic and Khanna[52] in the 33/50 Program; there are actions taken by facilities that have more impact than they are counted for. State legislation governing P2 policy is associated with both a significant increase in P2 actions and a significant decrease in emissions while required P2 policy had no significant impact on P2 actions and was actually associated with an increase in emissions. Given these results, required state policy is the most effective form of emissions-reductions legislation and should be instituted to see the most significant effect on emissions.

However, P2 actions per facility and emissions per facility were not found to have a significant impact on each other. This may be due to a factor independent of these variables, such as the influence of unique facility characteristics as found by Ramirez-

[52] Vidovic, Martina, and Neha Khanna. "Can voluntary pollution prevention programs fulfill their promises? Further evidence from the EPA's 33/50 Program." *Journal of Environmental Economics and Management* 53.2 (2007): 180-195.

Harrington in 2013.[53] Unique facility characteristics that may be in play include characteristics such as differences in EPA enforcement officials, the cooperation of management in developing P2 practices, and the type of industry represented by the facility. These may have an impact on both the adoption of P2 practices and the quantity of emissions released by a facility. It is possible that required state policy had a greater impact on the adoption of P2 actions because the legislation governed the states and provided a motivation for government inspectors to more strictly enforce pollution prevention management practices and other factors that may correlate to a decrease in emissions in industrial facilities.

The finding that required state policy positively influenced the average number of P2 actions taken by a facility substantiates a previous study that found that facilities adhering to management-based regulations participate in more P2 actions.[54] While previous studies have found that P2 legislation is associated with a greater number of P2 activities and a reduction in emissions,[55, 56] my study indicates that this may not be the case and that all P2 policies are not created equally. Although required facility policy still implements P2 legislation, it had no significant effect on the number of P2 actions taken by a facility and had an association with increased emissions. The unique facility characteristics that were at play in Ramirez-Harrington's study most likely play a larger

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[53] Ramirez Harrington, Donna. "Effectiveness of state pollution prevention programs and policies." *Contemporary Economic Policy* 31.2 (2013): 255-278.
[54] Bennear, Lori Snyder. "Are management- based regulations effective? Evidence from state pollution prevention programs." *Journal of Policy Analysis and Management* 26.2 (2007): 327-348.
[55] Ramirez Harrington, Donna. "Effectiveness of state pollution prevention programs and policies." *Contemporary Economic Policy* 31.2 (2013): 255-278.
[56] Bennear, Lori Snyder. "Are management- based regulations effective? Evidence from state pollution prevention programs." *Journal of Policy Analysis and Management* 26.2 (2007): 327-348.

role in required facility policy than in required state policy because required state policy is more standardized across facilities. Because required facility policy allows facilities more autonomy, there is more room for unique characteristics to influence the number of P2 actions and amount of emissions discharged. Differences in EPA enforcement officials may have been a strong influence here because a lack of motivation in regulations for the officials in required facility policy discourages strict enforcement and leaves room for differences in enforcement styles.

Section 4.2: Implications and Future Study

The results of this study are an important piece of guidance for states developing or revising their pollution prevention policies. While P2 actions themselves do not have a significant impact on emissions discharged, P2 policy independently has an effect on emissions discharges. The EPA should consider amplifying federal regulations to include mandatory P2 policy for states because of their association with emissions reductions as compared to strictly voluntary policies or facility oversight. To address the differences in EPA enforcement officials in different EPA regions, these regional officers should do site visits to facilities in other regions to see how policy implementation works in other states that have successfully reduce their emissions.

These results are especially relevant as President Obama recently announced the Clean Power Plan, a historic plan encouraging states to adopt pollution prevention policy

to reduce carbon emissions to 32 percent below the 2005 levels by 2030.[57] As a part of the first national plan regulating carbon emissions, states can use the results of my study to develop their plans to achieve the program's goals because it highlights the importance of the governing body developing a program with a goal of reducing emissions. There is a strong case for allowing states to develop and implement emissions-reduction policy as opposed to allowing facilities to maintain autonomy in these programs because policies developed by states have a greater impact on both actions taken by facilities and a reduction in target emissions.

However, it is possible that P2 actions and P2 policy type may influence solely carbon emissions when other emissions, such as the 1988 core chemicals, are not taken into consideration. Because the EPA does not measure carbon dioxide emissions as a part of the TRI but as a part of the Greenhouse Gas Reporting Program (GHGRP), there is no tool that integrates carbon emissions data with P2 actions data, as TRI.NET does for TRI-listed chemicals.[58] This development and use of such a tool can serve as an area of further study that may be helpful in developing policy for the Clean Power Plan. It is especially important to include greenhouse gases, such as carbon dioxide, in further study because industrial pollution is still an environmental health issue that needs to be addressed and improvements need to be made for the sake of both human and environmental health.

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[57] "Fact Sheet: Overview of the Clean Power Plan." 2015. 18 Feb. 2016 <http://www.epa.gov/cleanpowerplan/fact-sheet-overview-clean-power-plan>

[58] "Using GHG Inventory and GHGRP Data - US Environmental ..." 2015. 28 Mar. 2016 <http://epa.gov/climatechange/ghgemissions/inventoryexplorer/data_explorer_flight.html>

Appendix A

1988 Core Chemicals[59]

Chemical Name
1,1,1-TRICHLOROETHANE
1,1,2,2-TETRACHLOROETHANE
1,1,2-TRICHLOROETHANE
1,1-DIMETHYL HYDRAZINE
1,2,4-TRICHLOROBENZENE
1,2,4-TRIMETHYLBENZENE
1,2-BUTYLENE OXIDE
1,2-DIBROMO-3-CHLOROPROPANE
1,2-DIBROMOETHANE
1,2-DICHLOROBENZENE
1,2-DICHLOROETHANE
1,2-DICHLOROETHYLENE
1,2-DICHLOROPROPANE
1,2-DIPHENYLHYDRAZINE
1,3-BUTADIENE
1,3-DICHLOROBENZENE
1,3-DICHLOROPROPYLENE
1,4-DICHLOROBENZENE
1,4-DIOXANE
1-AMINO-2-METHYLANTHRAQUINONE
2,4,5-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4-D
2,4-DIAMINOANISOLE
2,4-DIAMINOANISOLE SULFATE
2,4-DIAMINOTOLUENE
2,4-DICHLOROPHENOL
2,4-DIMETHYLPHENOL
2,4-DINITROPHENOL
2,4-DINITROTOLUENE
2,6-DINITROTOLUENE
2,6-XYLIDINE
2-ACETYLAMINOFLUORENE
2-AMINOANTHRAQUINONE
2-CHLOROACETOPHENONE
2-ETHOXYETHANOL
2-METHOXYETHANOL

[59] "1988 Core Chemicals - Epa - Environmental Protection ..." 2011. 19 Feb. 2016 <http://iaspub.epa.gov/triexplorer/tri_text.list_chemical_core_88>

2-NITROPHENOL
2-NITROPROPANE
2-PHENYLPHENOL
3,3'-DICHLOROBENZIDINE
3,3'-DIMETHOXYBENZIDINE
3,3'-DIMETHYLBENZIDINE
4,4'-DIAMINODIPHENYL ETHER
4,4'-ISOPROPYLIDENEDIPHENOL
4,4'-METHYLENEBIS(2-CHLOROANILINE)
4,4'-METHYLENEBIS(N,N-DIMETHYL)BENZENAMINE
4,4'-METHYLENEDIANILINE
4,4'-THIODIANILINE
4,6-DINITRO-O-CRESOL
4-AMINOAZOBENZENE
4-AMINOBIPHENYL
4-DIMETHYLAMINOAZOBENZENE
4-NITROBIPHENYL
4-NITROPHENOL
5-NITRO-O-ANISIDINE
ACETALDEHYDE
ACETAMIDE
ACETONITRILE
ACROLEIN
ACRYLAMIDE
ACRYLIC ACID
ACRYLONITRILE
ALLYL CHLORIDE
ALPHA-NAPHTHYLAMINE
ALUMINUM (FUME OR DUST)
ANILINE
ANTHRACENE
ANTIMONY
ANTIMONY COMPOUNDS
ARSENIC
ARSENIC COMPOUNDS
ASBESTOS (FRIABLE)
BARIUM
BARIUM COMPOUNDS
BENZAL CHLORIDE
BENZAMIDE
BENZENE
BENZIDINE
BENZOIC TRICHLORIDE
BENZOYL CHLORIDE
BENZOYL PEROXIDE

BENZYL CHLORIDE
BERYLLIUM
BERYLLIUM COMPOUNDS
BETA-NAPHTHYLAMINE
BETA-PROPIOLACTONE
BIPHENYL
BIS(2-CHLORO-1-METHYLETHYL) ETHER
BIS(2-CHLOROETHYL) ETHER
BIS(CHLOROMETHYL) ETHER
BROMOFORM
BROMOMETHANE
BUTYL ACRYLATE
BUTYRALDEHYDE
C.I. ACID GREEN 3
C.I. BASIC GREEN 4
C.I. BASIC RED 1
C.I. DIRECT BLACK 38
C.I. DIRECT BLUE 6
C.I. DIRECT BROWN 95
C.I. DISPERSE YELLOW 3
C.I. FOOD RED 15
C.I. FOOD RED 5
C.I. SOLVENT ORANGE 7
C.I. SOLVENT YELLOW 14
C.I. SOLVENT YELLOW 3
C.I. SOLVENT YELLOW 34
C.I. VAT YELLOW 4
CADMIUM
CADMIUM COMPOUNDS
CALCIUM CYANAMIDE
CAPTAN
CARBARYL
CARBON DISULFIDE
CARBON TETRACHLORIDE
CARBONYL SULFIDE
CATECHOL
CERTAIN GLYCOL ETHERS
CHLORAMBEN
CHLORINE
CHLORINE DIOXIDE
CHLOROACETIC ACID
CHLOROBENZENE
CHLOROBENZILATE
CHLOROETHANE
CHLOROFORM

CHLOROMETHANE
CHLOROMETHYL METHYL ETHER
CHLOROPHENOLS
CHLOROPRENE
CHLOROTHALONIL
CHROMIUM
CHROMIUM COMPOUNDS(EXCEPT CHROMITE ORE MINED IN THE TRANSVAAL REGION)
COBALT
COBALT COMPOUNDS
COPPER
COPPER COMPOUNDS
CRESOL (MIXED ISOMERS)
CUMENE
CUMENE HYDROPEROXIDE
CUPFERRON
CYANIDE COMPOUNDS
CYCLOHEXANE
DECABROMODIPHENYL OXIDE
DI(2-ETHYLHEXYL) PHTHALATE
DIALLATE
DIAMINOTOLUENE (MIXED ISOMERS)
DIAZOMETHANE
DIBENZOFURAN
DIBUTYL PHTHALATE
DICHLOROBENZENE (MIXED ISOMERS)
DICHLOROBROMOMETHANE
DICHLOROMETHANE
DICHLORVOS
DICOFOL
DIEPOXYBUTANE
DIETHANOLAMINE
DIETHYL SULFATE
DIMETHYL PHTHALATE
DIMETHYL SULFATE
DIMETHYLCARBAMYL CHLORIDE
EPICHLOROHYDRIN
ETHYL ACRYLATE
ETHYL CHLOROFORMATE
ETHYLBENZENE
ETHYLENE
ETHYLENE GLYCOL
ETHYLENE OXIDE
ETHYLENE THIOUREA
ETHYLENEIMINE

FLUOMETURON
FORMALDEHYDE
FREON 113
HEXACHLORO-1,3-BUTADIENE
HEXACHLOROCYCLOPENTADIENE
HEXACHLOROETHANE
HEXACHLORONAPHTHALENE
HEXAMETHYLPHOSPHORAMIDE
HYDRAZINE
HYDRAZINE SULFATE
HYDROGEN CYANIDE
HYDROGEN FLUORIDE
HYDROQUINONE
ISOBUTYRALDEHYDE
ISOPROPYL ALCOHOL (MANUFACTURING,STRONG-ACID PROCESS ONLY,NO SUPPLIER)
LINDANE
M-CRESOL
M-XYLENE
MALEIC ANHYDRIDE
MANEB
MANGANESE
MANGANESE COMPOUNDS
METHANOL
METHYL ACRYLATE
METHYL HYDRAZINE
METHYL IODIDE
METHYL ISOBUTYL KETONE
METHYL ISOCYANATE
METHYL METHACRYLATE
METHYL TERT-BUTYL ETHER
METHYLENE BROMIDE
MICHLER'S KETONE
MIXTURE
MOLYBDENUM TRIOXIDE
MUSTARD GAS
N,N-DIMETHYLANILINE
N-BUTYL ALCOHOL
N-NITROSO-N-ETHYLUREA
N-NITROSO-N-METHYLUREA
N-NITROSODI-N-BUTYLAMINE
N-NITROSODI-N-PROPYLAMINE
N-NITROSODIETHYLAMINE
N-NITROSODIMETHYLAMINE
N-NITROSODIPHENYLAMINE

N-NITROSOMETHYLVINYLAMINE
N-NITROSOMORPHOLINE
N-NITROSONORNICOTINE
N-NITROSOPIPERIDINE
NAPHTHALENE
NICKEL
NICKEL COMPOUNDS
NITRIC ACID
NITRILOTRIACETIC ACID
NITROBENZENE
NITROFEN
NITROGEN MUSTARD
NITROGLYCERIN
O-ANISIDINE
O-ANISIDINE HYDROCHLORIDE
O-CRESOL
O-TOLUIDINE
O-TOLUIDINE HYDROCHLORIDE
O-XYLENE
OCTACHLORONAPHTHALENE
OSMIUM TETROXIDE
P-ANISIDINE
P-CRESIDINE
P-CRESOL
P-NITROSODIPHENYLAMINE
P-PHENYLENEDIAMINE
P-XYLENE
PARATHION
PENTACHLOROPHENOL
PERACETIC ACID
PHENOL
PHOSGENE
PHOSPHORUS (YELLOW OR WHITE)
PHTHALIC ANHYDRIDE
PICRIC ACID
POLYBROMINATED BIPHENYLS
PROPANE SULTONE
PROPIONALDEHYDE
PROPOXUR
PROPYLENE
PROPYLENE OXIDE
PROPYLENEIMINE
PYRIDINE
QUINOLINE
QUINONE

QUINTOZENE
SACCHARIN (MANUFACTURING, NO SUPPLIER NOTIFICATION)
SAFROLE
SEC-BUTYL ALCOHOL
SELENIUM
SELENIUM COMPOUNDS
SILVER
SILVER COMPOUNDS
STYRENE
STYRENE OXIDE
TERT-BUTYL ALCOHOL
TETRACHLOROETHYLENE
TETRACHLORVINPHOS
THALLIUM
THALLIUM COMPOUNDS
THIOACETAMIDE
THIOUREA
THORIUM DIOXIDE
TITANIUM TETRACHLORIDE
TOLUENE
TOLUENE-2,4-DIISOCYANATE
TOLUENE-2,6-DIISOCYANATE
TRADE SECRET CHEMICAL
TRIAZIQUONE
TRICHLORFON
TRICHLOROETHYLENE
TRIS(2,3-DIBROMOPROPYL) PHOSPHATE
URETHANE
VINYL ACETATE
VINYL BROMIDE
VINYL CHLORIDE
VINYLIDENE CHLORIDE
XYLENE (MIXED ISOMERS)
ZINC (FUME OR DUST)
ZINC COMPOUNDS
ZINEB

Appendix B

2011 Core Chemicals[60]

Chemical Name
1,1,1,2-TETRACHLORO-2-FLUOROETHANE
1,1,1,2-TETRACHLOROETHANE
1,1,1-TRICHLOROETHANE
1,1,2,2-TETRACHLORO-1-FLUOROETHANE
1,1,2,2-TETRACHLOROETHANE
1,1,2-TRICHLOROETHANE
1,1-DICHLORO-1,2,2,3,3-PENTAFLUOROPROPANE
1,1-DICHLORO-1,2,2-TRIFLUOROETHANE
1,1-DICHLORO-1,2,3,3,3-PENTAFLUOROPROPANE
1,1-DICHLORO-1-FLUOROETHANE
1,1-DIMETHYL HYDRAZINE
1,2,3-TRICHLOROPROPANE
1,2,4-TRICHLOROBENZENE
1,2,4-TRIMETHYLBENZENE
1,2-BUTYLENE OXIDE
1,2-DIBROMO-3-CHLOROPROPANE
1,2-DIBROMOETHANE
1,2-DICHLORO-1,1,2,3,3-PENTAFLUOROPROPANE
1,2-DICHLORO-1,1,2-TRIFLUOROETHANE
1,2-DICHLORO-1,1,3,3,3-PENTAFLUOROPROPANE
1,2-DICHLORO-1,1-DIFLUOROETHANE
1,2-DICHLOROBENZENE
1,2-DICHLOROETHANE
1,2-DICHLOROETHYLENE
1,2-DICHLOROPROPANE
1,2-DIPHENYLHYDRAZINE
1,2-PHENYLENEDIAMINE
1,2-PHENYLENEDIAMINE DIHYDROCHLORIDE
1,3-BUTADIENE
1,3-DICHLORO-1,1,2,2,3-PENTAFLUOROPROPANE
1,3-DICHLORO-1,1,2,3,3-PENTAFLUOROPROPANE
1,3-DICHLOROBENZENE
1,3-DICHLOROPROPYLENE
1,3-PHENYLENEDIAMINE
1,4-DICHLORO-2-BUTENE
1,4-DICHLOROBENZENE
1,4-DIOXANE

[60] "2011 Core Chemicals | TRI Explorer | US EPA." 2012. 19 Feb. 2016 <http://iaspub.epa.gov/triexplorer/tri_text.list_chemical_core_11>

1,4-PHENYLENEDIAMINE DIHYDROCHLORIDE
1-(3-CHLOROALLYL)-3,5,7-TRIAZA-1-AZONIAADAMANTANE CHLORIDE
1-AMINO-2,4-DIBROMOANTHRAQUINONE
1-AMINO-2-METHYLANTHRAQUINONE
1-BROMO-1-(BROMOMETHYL)-1,3-PROPANEDICARBONITRILE
1-CHLORO-1,1,2,2-TETRAFLUOROETHANE
1-CHLORO-1,1-DIFLUOROETHANE
2,2-BIS(BROMOMETHYL)-1,3-PROPANEDIOL
2,2-DICHLORO-1,1,1,3,3-PENTAFLUOROPROPANE
2,2-DICHLORO-1,1,1-TRIFLUOROETHANE
2,3,5-TRIMETHYLPHENYL METHYLCARBAMATE
2,3-DICHLORO-1,1,1,2,3-PENTAFLUOROPROPANE
2,3-DICHLOROPROPENE
2,4,5-TRICHLOROPHENOL
2,4,6-TRICHLOROPHENOL
2,4-D
2,4-D 2-ETHYL-4-METHYLPENTYL ESTER
2,4-D 2-ETHYLHEXYL ESTER
2,4-D BUTOXYETHYL ESTER
2,4-D BUTYL ESTER
2,4-D CHLOROCROTYL ESTER
2,4-D ISOPROPYL ESTER
2,4-D PROPYLENE GLYCOL BUTYL ETHER ESTER
2,4-D SODIUM SALT
2,4-DB
2,4-DIAMINOANISOLE
2,4-DIAMINOANISOLE SULFATE
2,4-DIAMINOTOLUENE
2,4-DICHLOROPHENOL
2,4-DIMETHYLPHENOL
2,4-DINITROPHENOL
2,4-DINITROTOLUENE
2,4-DITHIOBIURET
2,4-DP
2,6-DINITROTOLUENE
2,6-XYLIDINE
2-ACETYLAMINOFLUORENE
2-AMINOANTHRAQUINONE
2-CHLORO-1,1,1,2-TETRAFLUOROETHANE
2-CHLORO-1,1,1-TRIFLUOROETHANE
2-CHLOROACETOPHENONE
2-ETHOXYETHANOL
2-MERCAPTOBENZOTHIAZOLE
2-METHOXYETHANOL
2-METHYLLACTONITRILE

2-METHYLPYRIDINE
2-NITROPHENOL
2-NITROPROPANE
2-PHENYLPHENOL
3,3'-DICHLOROBENZIDINE
3,3'-DICHLOROBENZIDINE DIHYDROCHLORIDE
3,3'-DICHLOROBENZIDINE SULFATE
3,3'-DIMETHOXYBENZIDINE
3,3'-DIMETHOXYBENZIDINE DIHYDROCHLORIDE
3,3'-DIMETHOXYBENZIDINE HYDROCHLORIDE
3,3'-DIMETHYLBENZIDINE
3,3'-DIMETHYLBENZIDINE DIHYDROCHLORIDE
3,3'-DIMETHYLBENZIDINE DIHYDROFLUORIDE
3,3-DICHLORO-1,1,1,2,2-PENTAFLUOROPROPANE
3-CHLORO-1,1,1-TRIFLUOROPROPANE
3-CHLORO-2-METHYL-1-PROPENE
3-CHLOROPROPIONITRILE
3-IODO-2-PROPYNYL BUTYLCARBAMATE
4,4'-DIAMINODIPHENYL ETHER
4,4'-ISOPROPYLIDENEDIPHENOL
4,4'-METHYLENEBIS(2-CHLOROANILINE)
4,4'-METHYLENEBIS(N,N-DIMETHYL)BENZENAMINE
4,4'-METHYLENEDIANILINE
4,4'-THIODIANILINE
4,6-DINITRO-O-CRESOL
4-AMINOAZOBENZENE
4-AMINOBIPHENYL
4-DIMETHYLAMINOAZOBENZENE
4-NITROBIPHENYL
4-NITROPHENOL
5-NITRO-O-ANISIDINE
5-NITRO-O-TOLUIDINE
ABAMECTIN
ACEPHATE
ACETALDEHYDE
ACETAMIDE
ACETONITRILE
ACETOPHENONE
ACIFLUORFEN, SODIUM SALT
ACROLEIN
ACRYLAMIDE
ACRYLIC ACID
ACRYLONITRILE
ALACHLOR
ALDICARB

ALDRIN
ALLYL ALCOHOL
ALLYL CHLORIDE
ALLYLAMINE
ALPHA-HEXACHLOROCYCLOHEXANE
ALPHA-NAPHTHYLAMINE
ALUMINUM (FUME OR DUST)
ALUMINUM OXIDE (FIBROUS FORMS)
ALUMINUM PHOSPHIDE
AMETRYN
AMITRAZ
AMITROLE
AMMONIA
ANILAZINE
ANILINE
ANTHRACENE
ANTIMONY
ANTIMONY COMPOUNDS
ARSENIC
ARSENIC COMPOUNDS
ASBESTOS (FRIABLE)
ATRAZINE
BARIUM
BARIUM COMPOUNDS
BENDIOCARB
BENFLURALIN
BENOMYL
BENZAL CHLORIDE
BENZAMIDE
BENZENE
BENZIDINE
BENZO(G,H,I)PERYLENE
BENZOIC TRICHLORIDE
BENZOYL CHLORIDE
BENZOYL PEROXIDE
BENZYL CHLORIDE
BERYLLIUM
BERYLLIUM COMPOUNDS
BETA-NAPHTHYLAMINE
BETA-PROPIOLACTONE
BIFENTHRIN
BIPHENYL
BIS(2-CHLORO-1-METHYLETHYL) ETHER
BIS(2-CHLOROETHOXY)METHANE
BIS(2-CHLOROETHYL) ETHER

BIS(CHLOROMETHYL) ETHER
BIS(TRIBUTYLTIN) OXIDE
BORON TRICHLORIDE
BORON TRIFLUORIDE
BROMACIL
BROMACIL, LITHIUM SALT
BROMINE
BROMOCHLORODIFLUOROMETHANE
BROMOFORM
BROMOMETHANE
BROMOTRIFLUOROMETHANE
BROMOXYNIL
BROMOXYNIL OCTANOATE
BRUCINE
BUTYL ACRYLATE
BUTYRALDEHYDE
C.I. ACID GREEN 3
C.I. ACID RED 114
C.I. BASIC GREEN 4
C.I. BASIC RED 1
C.I. DIRECT BLACK 38
C.I. DIRECT BLUE 218
C.I. DIRECT BLUE 6
C.I. DIRECT BROWN 95
C.I. DISPERSE YELLOW 3
C.I. FOOD RED 15
C.I. FOOD RED 5
C.I. SOLVENT ORANGE 7
C.I. SOLVENT YELLOW 14
C.I. SOLVENT YELLOW 3
C.I. SOLVENT YELLOW 34
C.I. VAT YELLOW 4
CADMIUM
CADMIUM COMPOUNDS
CALCIUM CYANAMIDE
CAPTAN
CARBARYL
CARBOFURAN
CARBON DISULFIDE
CARBON TETRACHLORIDE
CARBONYL SULFIDE
CARBOXIN
CATECHOL
CERTAIN GLYCOL ETHERS
CHINOMETHIONAT

CHLORAMBEN
CHLORDANE
CHLORENDIC ACID
CHLORIMURON ETHYL
CHLORINE
CHLORINE DIOXIDE
CHLOROACETIC ACID
CHLOROBENZENE
CHLOROBENZILATE
CHLORODIFLUOROMETHANE
CHLOROETHANE
CHLOROFORM
CHLOROMETHANE
CHLOROMETHYL METHYL ETHER
CHLOROPHENOLS
CHLOROPICRIN
CHLOROPRENE
CHLOROTETRAFLUOROETHANE
CHLOROTHALONIL
CHLOROTRIFLUOROMETHANE
CHLORPYRIFOS METHYL
CHLORSULFURON
CHROMIUM
CHROMIUM COMPOUNDS(EXCEPT CHROMITE ORE MINED IN THE TRANSVAAL REGION)
COBALT
COBALT COMPOUNDS
COPPER
COPPER COMPOUNDS
CREOSOTE
CRESOL (MIXED ISOMERS)
CROTONALDEHYDE
CUMENE
CUMENE HYDROPEROXIDE
CUPFERRON
CYANAZINE
CYANIDE COMPOUNDS
CYCLOATE
CYCLOHEXANE
CYCLOHEXANOL
CYFLUTHRIN
CYHALOTHRIN
D-TRANS-ALLETHRIN
DAZOMET
DAZOMET, SODIUM SALT
DECABROMODIPHENYL OXIDE

DESMEDIPHAM
DI(2-ETHYLHEXYL) PHTHALATE
DIALLATE
DIAMINOTOLUENE (MIXED ISOMERS)
DIAZINON
DIAZOMETHANE
DIBENZOFURAN
DIBROMOTETRAFLUOROETHANE
DIBUTYL PHTHALATE
DICAMBA
DICHLORAN
DICHLORO-1,1,2-TRIFLUOROETHANE
DICHLOROBENZENE (MIXED ISOMERS)
DICHLOROBROMOMETHANE
DICHLORODIFLUOROMETHANE
DICHLOROFLUOROMETHANE
DICHLOROMETHANE
DICHLOROPENTAFLUOROPROPANE
DICHLOROPHENE
DICHLOROTETRAFLUOROETHANE (CFC-114)
DICHLOROTRIFLUOROETHANE
DICHLORVOS
DICLOFOP METHYL
DICOFOL
DICYCLOPENTADIENE
DIEPOXYBUTANE
DIETHANOLAMINE
DIETHATYL ETHYL
DIETHYL SULFATE
DIFLUBENZURON
DIGLYCIDYL RESORCINOL ETHER
DIHYDROSAFROLE
DIISOCYANATES
DIMETHIPIN
DIMETHOATE
DIMETHYL CHLOROTHIOPHOSPHATE
DIMETHYL PHTHALATE
DIMETHYL SULFATE
DIMETHYLAMINE
DIMETHYLAMINE DICAMBA
DIMETHYLCARBAMYL CHLORIDE
DINITROBUTYL PHENOL
DINITROTOLUENE (MIXED ISOMERS)
DINOCAP
DIOXIN AND DIOXIN-LIKE COMPOUNDS

DIPHENAMID
DIPHENYLAMINE
DIPOTASSIUM ENDOTHALL
DIPROPYL ISOCINCHOMERONATE
DISODIUM CYANODITHIOIMIDOCARBONATE
DIURON
DODINE
EPICHLOROHYDRIN
ETHOPROP
ETHYL ACRYLATE
ETHYL CHLOROFORMATE
ETHYL DIPROPYLTHIOCARBAMATE
ETHYLBENZENE
ETHYLENE
ETHYLENE GLYCOL
ETHYLENE OXIDE
ETHYLENE THIOUREA
ETHYLENEBISDITHIOCARBAMIC ACID, SALTS AND ESTERS
ETHYLENEIMINE
ETHYLIDENE DICHLORIDE
FAMPHUR
FENARIMOL
FENBUTATIN OXIDE
FENOXAPROP ETHYL
FENOXYCARB
FENPROPATHRIN
FENTHION
FENVALERATE
FERBAM
FLUAZIFOP BUTYL
FLUOMETURON
FLUORINE
FLUOROURACIL
FLUVALINATE
FOLPET
FOMESAFEN
FORMALDEHYDE
FORMIC ACID
FREON 113
FURAN
GLYCIDOL
HEPTACHLOR
HEXACHLORO-1,3-BUTADIENE
HEXACHLOROBENZENE
HEXACHLOROCYCLOPENTADIENE

HEXACHLOROETHANE
HEXACHLORONAPHTHALENE
HEXACHLOROPHENE
HEXAMETHYLPHOSPHORAMIDE
HEXAZINONE
HYDRAMETHYLNON
HYDRAZINE
HYDRAZINE SULFATE
HYDROCHLORIC ACID (1995 AND AFTER "ACID AEROSOLS" ONLY)
HYDROGEN CYANIDE
HYDROGEN FLUORIDE
HYDROQUINONE
IMAZALIL
INVALID
IRON PENTACARBONYL
ISOBUTYRALDEHYDE
ISODRIN
ISOFENPHOS
ISOPRENE
ISOPROPYL ALCOHOL (MANUFACTURING,STRONG-ACID PROCESS ONLY,NO SUPPLIER)
ISOSAFROLE
LACTOFEN
LEAD
LEAD COMPOUNDS
LINDANE
LINURON
LITHIUM CARBONATE
M-CRESOL
M-DINITROBENZENE
M-XYLENE
MALATHION
MALEIC ANHYDRIDE
MALONONITRILE
MANEB
MANGANESE
MANGANESE COMPOUNDS
MECOPROP
MERCURY
MERCURY COMPOUNDS
MERPHOS
METHACRYLONITRILE
METHAM SODIUM
METHANOL
METHAZOLE
METHIOCARB

METHOXONE
METHOXONE SODIUM SALT
METHOXYCHLOR
METHYL ACRYLATE
METHYL CHLOROCARBONATE
METHYL HYDRAZINE
METHYL IODIDE
METHYL ISOBUTYL KETONE
METHYL ISOCYANATE
METHYL ISOTHIOCYANATE
METHYL METHACRYLATE
METHYL PARATHION
METHYL TERT-BUTYL ETHER
METHYLENE BROMIDE
METHYLEUGENOL
METIRAM
METRIBUZIN
MEVINPHOS
MICHLER'S KETONE
MIXTURE
MOLINATE
MOLYBDENUM TRIOXIDE
MONOCHLOROPENTAFLUOROETHANE
MONURON
MUSTARD GAS
MYCLOBUTANIL
N,N-DIMETHYLANILINE
N,N-DIMETHYLFORMAMIDE
N-BUTYL ALCOHOL
N-HEXANE
N-METHYL-2-PYRROLIDONE
N-METHYLOLACRYLAMIDE
N-NITROSO-N-ETHYLUREA
N-NITROSO-N-METHYLUREA
N-NITROSODI-N-BUTYLAMINE
N-NITROSODI-N-PROPYLAMINE
N-NITROSODIETHYLAMINE
N-NITROSODIMETHYLAMINE
N-NITROSODIPHENYLAMINE
N-NITROSOMETHYLVINYLAMINE
N-NITROSOMORPHOLINE
N-NITROSONORNICOTINE
N-NITROSOPIPERIDINE
NA
NABAM

NALED
NAPHTHALENE
NICKEL
NICKEL COMPOUNDS
NICOTINE AND SALTS
NITRAPYRIN
NITRATE COMPOUNDS
NITRIC ACID
NITRILOTRIACETIC ACID
NITROBENZENE
NITROFEN
NITROGEN MUSTARD
NITROGLYCERIN
NITROMETHANE
NORFLURAZON
O-ANISIDINE
O-ANISIDINE HYDROCHLORIDE
O-CRESOL
O-DINITROBENZENE
O-NITROANISOLE
O-TOLUIDINE
O-TOLUIDINE HYDROCHLORIDE
O-XYLENE
OCTACHLORONAPHTHALENE
OCTACHLOROSTYRENE
ORYZALIN
OSMIUM TETROXIDE
OXYDEMETON METHYL
OXYDIAZON
OXYFLUORFEN
OZONE
P-ANISIDINE
P-CHLORO-O-TOLUIDINE
P-CHLOROANILINE
P-CHLOROPHENYL ISOCYANATE
P-CRESIDINE
P-CRESOL
P-DINITROBENZENE
P-NITROANILINE
P-NITROSODIPHENYLAMINE
P-PHENYLENEDIAMINE
P-XYLENE
PARALDEHYDE
PARAQUAT DICHLORIDE
PARATHION

PEBULATE
PENDIMETHALIN
PENTACHLOROBENZENE
PENTACHLOROETHANE
PENTACHLOROPHENOL
PENTOBARBITAL SODIUM
PERACETIC ACID
PERCHLOROMETHYL MERCAPTAN
PERMETHRIN
PHENANTHRENE
PHENOL
PHENOLPHTHALEIN
PHENOTHRIN
PHENYTOIN
PHOSGENE
PHOSPHINE
PHOSPHORUS (YELLOW OR WHITE)
PHTHALIC ANHYDRIDE
PICLORAM
PICRIC ACID
PIPERONYL BUTOXIDE
PIRIMIPHOS METHYL
POLYBROMINATED BIPHENYLS
POLYCHLORINATED ALKANES
POLYCHLORINATED BIPHENYLS
POLYCYCLIC AROMATIC COMPOUNDS
POTASSIUM BROMATE
POTASSIUM DIMETHYLDITHIOCARBAMATE
POTASSIUM N-METHYLDITHIOCARBAMATE
PROFENOFOS
PROMETRYN
PRONAMIDE
PROPACHLOR
PROPANE SULTONE
PROPANIL
PROPARGITE
PROPARGYL ALCOHOL
PROPETAMPHOS
PROPICONAZOLE
PROPIONALDEHYDE
PROPOXUR
PROPYLENE
PROPYLENE OXIDE
PROPYLENEIMINE
PYRIDINE

QUINOLINE
QUINONE
QUINTOZENE
QUIZALOFOP-ETHYL
RESMETHRIN
S,S,S-TRIBUTYLTRITHIOPHOSPHATE
SACCHARIN (MANUFACTURING, NO SUPPLIER NOTIFICATION)
SAFROLE
SEC-BUTYL ALCOHOL
SELENIUM
SELENIUM COMPOUNDS
SETHOXYDIM
SILVER
SILVER COMPOUNDS
SIMAZINE
SODIUM AZIDE
SODIUM DICAMBA
SODIUM DIMETHYLDITHIOCARBAMATE
SODIUM FLUOROACETATE
SODIUM NITRITE
SODIUM O-PHENYLPHENOXIDE
SODIUM PENTACHLOROPHENATE
STRYCHNINE AND SALTS
STYRENE
STYRENE OXIDE
SULFURIC ACID (1994 AND AFTER "ACID AEROSOLS" ONLY)
SULFURYL FLUORIDE
SULPROFOS
TEBUTHIURON
TEMEPHOS
TERBACIL
TERT-BUTYL ALCOHOL
TETRABROMOBISPHENOL A
TETRACHLOROETHYLENE
TETRACHLORVINPHOS
TETRACYCLINE HYDROCHLORIDE
TETRAFLUOROETHYLENE
TETRAMETHRIN
TETRANITROMETHANE
THALLIUM
THALLIUM COMPOUNDS
THIABENDAZOLE
THIOACETAMIDE
THIOBENCARB
THIODICARB

THIOPHANATE ETHYL
THIOPHANATE-METHYL
THIOSEMICARBAZIDE
THIOUREA
THIRAM
THORIUM DIOXIDE
TITANIUM TETRACHLORIDE
TOLUENE
TOLUENE DIISOCYANATE (MIXED ISOMERS)
TOLUENE-2,4-DIISOCYANATE
TOLUENE-2,6-DIISOCYANATE
TOXAPHENE
TRADE SECRET CHEMICAL
TRANS-1,3-DICHLOROPROPENE
TRANS-1,4-DICHLORO-2-BUTENE
TRIADIMEFON
TRIALLATE
TRIAZIQUONE
TRIBENURON METHYL
TRIBUTYLTIN FLUORIDE
TRIBUTYLTIN METHACRYLATE
TRICHLORFON
TRICHLOROACETYL CHLORIDE
TRICHLOROETHYLENE
TRICHLOROFLUOROMETHANE
TRICLOPYR TRIETHYLAMMONIUM SALT
TRIETHYLAMINE
TRIFLURALIN
TRIFORINE
TRIPHENYLTIN CHLORIDE
TRIPHENYLTIN HYDROXIDE
TRIS(2,3-DIBROMOPROPYL) PHOSPHATE
TRYPAN BLUE
URETHANE
VANADIUM (EXCEPT WHEN CONTAINED IN AN ALLOY)
VANADIUM COMPOUNDS
VINCLOZOLIN
VINYL ACETATE
VINYL BROMIDE
VINYL CHLORIDE
VINYL FLUORIDE
VINYLIDENE CHLORIDE
WARFARIN AND SALTS
XYLENE (MIXED ISOMERS)
ZINC (FUME OR DUST)

ZINC COMPOUNDS
ZINEB

Appendix C

Form Approved OMB Number: 2025-0009
Approval Expires: 11/30/2017 **Page 1 of 6**

EPA
United States
Environmental Protection Agency

FORM R

Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986, also Known as Title III of the Superfund Amendments and Reauthorization Act

TRI Facility ID Number

Toxic Chemical, Category, or Generic Name

This section only applies if you are revising or withdrawing a previously submitted form, otherwise leave blank.	**Revision (Enter up to two code(s))**	**Withdrawal (Enter up to two code(s))**

IMPORTANT: See instructions to determine when "Not Applicable (NA)" boxes should be checked.

PART I. FACILITY IDENTIFICATION INFORMATION

SECTION 1. REPORTING YEAR _____

SECTION 2. TRADE SECRET INFORMATION

2.1 Are you claiming the toxic chemical identified on page 2 as a trade secret? ☐ Yes (Answer question 2.2; attach substantiation forms) ☐ No (Do not answer 2.2; go to Section 3)

2.2 Is this copy ☐ Sanitized ☐ Unsanitized (Answer only if "Yes" in 2.1)

SECTION 3. CERTIFICATION (Important: Read and sign after completing all form sections.)

I hereby certify that I have reviewed the attached documents and that, to the best of my knowledge and belief, the submitted information is true and complete and that the amounts and values in this report are accurate based on reasonable estimates using data available to the preparers of this report.

Name and official title of owner/operator or senior management official:	Signature:	Date signed:

SECTION 4. FACILITY IDENTIFICATION

4.1	Facility or Establishment Name	TRI Facility ID Number	
	Physical Street Address	Mailing Address (if different from physical street address)	
	City/County/Tribe/State/ZIP Code	City/State/ZIP Code	Country (Non-US)
4.2	This report contains information for: (Important: Check a or b; check c or d if applicable)	a. ☐ An entire facility b. ☐ Part of a facility c. ☐ A federal facility d. ☐ GOCO	
4.3	Technical Contact Name		Telephone Number (include area code and ext.)
	Email Address		
4.4	Public Contact Name		Telephone Number (include area code and ext.)
	Email Address		

4.5	NAICS Code(s) (6 digits)	Primary a.	b.	c.	d.	e.	f.
4.6	Dun & Bradstreet Number(s) (9 digits)	a.					
		b.					

SECTION 5. Parent Company Information

5.1	Name of U.S. Parent Company (for TRI Reporting purposes)		No U.S. Parent Company (for TRI Reporting purposes) ☐
5.2	Parent Company's Dun & Bradstreet Number	**NA** ☐	

EPA form 9350 -1 (Rev 06/2014) – Previous editions are obsolete.

Form Approved OMB Number: 2025-0009
Approval Expires: 11/30/2017

FORM R

Part II. CHEMICAL-SPECIFIC INFORMATION

TRI Facility ID Number

Toxic Chemical, Category, or Generic Name

SECTION 1. TOXIC CHEMICAL IDENTITY

(Important: DO NOT complete this section if you are reporting a mixture component in Section 2 below.)

1.1	CAS Number (Important: Enter only one number exactly as it appears on the Section 313 list. Enter category code if reporting a chemical category.)
1.2	Toxic Chemical or Chemical Category Name (Important: Enter only one name exactly as it appears on the Section 313 list.)
1.3	Generic Chemical Name (Important: Complete only if Part I, Section 2.1 is checked "Yes". Generic Name must be structurally descriptive.)

SECTION 2. MIXTURE COMPONENT IDENTITY

(Important: DO NOT complete this section if you completed Section 1.)

2.1	Generic Chemical Name Provided by Supplier (Important: Maximum of 70 characters, including numbers, letters, spaces, and punctuation.)

SECTION 3. ACTIVITIES AND USES OF THE TOXIC CHEMICAL AT THE FACILITY

(Important: Check all that apply.)

3.1 Manufacture the toxic chemical:	3.2 Process the toxic chemical:	3.3 Otherwise use the toxic chemical:
a. ☐ Produce b. ☐ Import If Produce or Import c. ☐ For on-site use/processing d. ☐ For sale/distribution e. ☐ As a byproduct f. ☐ As an impurity	a. ☐ As a reactant b. ☐ As a formulation component c. ☐ As an article component d. ☐ Repackaging e. ☐ As an impurity	a. ☐ As a chemical processing aid b. ☐ As a manufacturing aid c. ☐ Ancillary or other use

SECTION 4. MAXIMUM AMOUNT OF THE TOXIC CHEMICAL ON-SITE AT ANY TIME DURING THE CALENDAR YEAR

4.1	☐ (Enter two digit code from instruction package.)	

SECTION 5. QUANTITY OF THE TOXIC CHEMICAL ENTERING EACH ENVIRONMENTAL MEDIUM ON-SITE

			A. Total Release (pounds/year*) (Enter a range code** or estimate)	B. Basis of Estimate (Enter code)	C. Percent from Stormwater
5.1	Fugitive or non-point air emissions	NA ☐			
5.2	Stack or point air emissions	NA ☐			
5.3	Discharges to receiving streams or water bodies (Enter one name per box)	NA ☐			
	Stream or Water Body Name	Reach Code (optional)			
5.3.1					
5.3.2					
5.3.3					

If additional pages of Part II, Section 5.3 are attached, indicate the total number of pages in this box ☐ and indicate the Part II, Section 5.3 page number in this box. ☐ (Example: 1, 2, 3, etc.)

*For Dioxin or Dioxin-like compounds, report in grams/year.
**Range Codes: A– 1-10 pounds; B– 11-499 pounds; C– 500-999 pounds.

Form Approved OMB Number: 2025-0009
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FORM R

Part II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)

TRI Facility ID Number
Toxic Chemical, Category, or Generic Name

SECTION 5. QUANTITY OF THE TOXIC CHEMICAL ENTERING EACH ENVIRONMENTAL MEDIUM ON-SITE (continued)

		NA	A. Total Release (pounds/year*) (Enter a range code** or estimate)	B. Basis of Estimate (Enter code)
5.4-5.5	Disposal to land on-site			
5.4.1	Class I Underground Injection Wells	☐		
5.4.2	Class II-V Underground Injection Wells	☐		
5.5.1A	RCRA Subtitle C landfills	☐		
5.5.1B	Other landfills	☐		
5.5.2	Land treatment/application farming	☐		
5.5.3A	RCRA Subtitle C surface impoundments	☐		
5.5.3B	Other surface impoundments	☐		
5.5.4	Other disposal	☐		

SECTION 6. TRANSFER(S) OF THE TOXIC CHEMICAL IN WASTES TO OFF-SITE LOCATIONS

6.1 DISCHARGES TO PUBLICLY OWNED TREATMENT WORKS (POTWs) NA ☐

6.1.___	POTW Name						
POTW Address							
City		County		State		ZIP	

A. Quantity Transferred to this POTW (pounds/year*) (Enter range code**or estimate)	B. Basis of Estimate (Enter code)

If additional pages of Part II, Section 6.1 are attached, indicate the total number of pages in this box ☐
and indicate the Part II, Section 6.1 page number in this box. ☐ (Example: 1, 2, 3, etc.)

SECTION 6.2 TRANSFERS TO OTHER OFF-SITE LOCATIONS NA ☐

6.2.___	Off-Site EPA Identification Number (RCRA ID No.)								
Off-Site Location Name:									
Off-Site Address:									
City		County		State		ZIP		Country (non-US)	

Is this location under control of reporting facility or parent company? ☐ Yes ☐ No

*For Dioxin or Dioxin-like compounds, report in grams/year.
**Range Codes: A= 1-10 pounds; B= 11-499 pounds; C= 500-999 pounds.

Form Approved OMB Number: 2025-0009
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FORM R

Part II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)

TRI Facility ID Number

Toxic Chemical, Category, or Generic Name

SECTION 6.2. TRANSFERS TO OTHER OFF-SITE LOCATION (CONTINUED)

A. Total Transfer (pounds/year*) (Enter a range code** or estimate)	B. Basis of Estimate (Enter code)	C. Type of Waste Treatment/Disposal/ Recycling/Energy Recovery (Enter code)
1.	1.	1. M
2.	2.	2. M
3.	3.	3. M
4.	4.	4. M

6.2____ Off-Site EPA Identification Number (RCRA ID No.)

Off-Site Location Name:

Off-Site Address:

City | County | State | ZIP | Country (non-US)

Is this location under control of reporting facility or parent company? ☐ Yes ☐ No

A. Total Transfer (pounds/year*) (Enter a range code** or estimate)	B. Basis of Estimate (Enter code)	C. Type of Waste Treatment/Disposal/ Recycling/Energy Recovery (Enter code)
1.	1.	1. M
2.	2.	2. M
3.	3.	3. M
4.	4.	4. M

SECTION 7A. ON-SITE WASTE TREATMENT METHODS AND EFFICIENCY

☐ Not Applicable (NA) - Check here if no on-site waste treatment method is applied to any waste stream containing the toxic chemical or chemical category.

a. General Waste Stream (Enter code)	b. Waste Treatment Method(s) Sequence (Enter 3- or 4-character code(s))								c. Waste Treatment Efficiency (Enter 2 character code)
7A.1a	7A.1b		1		2		3		7A.1c
	4		5		6		7		
7A.2a	7A.2b		1		2		3		7A.2c
	4		5		6		7		
7A.3a	7A.3b		1		2		3		7A.3c
	4		5		6		7		
7A.4a	7A.4b		1		2		3		7A.4c
	4		5		6		7		
7A.5a	7A.5b		1		2		3		7A.5c
	4		5		6		7		

If additional pages of Part II, Section 6.2/7.A are attached, indicate the total number of pages in this ☐ box and indicate the Part II, Section 6.2/7.A page number in this box. ☐ (Example: 1, 2, 3, etc.)

*For Dioxin or Dioxin-like compounds, report in grams/year.
**Range Codes: A= 1-10 pounds; B= 11-499 pounds; C= 500-999 pounds.

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FORM R

Part II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)

TRI Facility ID Number
Toxic Chemical, Category, or Generic Name

SECTION 7B. ON-SITE ENERGY RECOVERY PROCESSES

☐ NA Check here if no on-site energy recovery is applied to any waste stream containing the toxic chemical or chemical category.

Energy Recovery Methods (Enter 3-character code(s))

1 ☐ 2 ☐ 3 ☐

SECTION 7C. ON-SITE RECYLING PROCESSES

☐ NA Check here if no on-site recycling is applied to any waste stream containing the toxic chemical or chemical category.

Recycling Methods (Enter 3-character code(s))

1. ☐ 2. ☐ 3. ☐

SECTION 8. SOURCE REDUCTION AND WASTE MANAGEMENT

		Column A Prior Year (pounds/year*)	Column B Current Reporting Year (pounds/year*)	Column C Following Year (pounds/year*)	Column D Second Following Year (pounds/year*)
8.1 – 8.7 Production-Related Waste Managed					
8.1a	Total on-site disposal to Class I Underground Injection Wells, RCRA Subtitle C landfills, and other landfills				
8.1b	Total other on-site disposal or other releases				
8.1c	Total off-site disposal to Class I Underground Injection Wells, RCRA Subtitle C landfills, and other landfills				
8.1d	Total other off-site disposal or other releases				
8.2	Quantity used for energy recovery on-site				
8.3	Quantity used for energy recovery off-site				
8.4	Quantity recycled on-site				
8.5	Quantity recycled off-site				
8.6	Quantity treated on-site				
8.7	Quantity treated off-site				
8.8	Non-production-related waste managed**				
8.9	☐ Production ratio or ☐ Activity ratio (select one and enter value to right)				
8.10	Did your facility engage in any newly implemented source reduction activities for this chemical during the reporting year? If so, complete the following section; if not, check NA. **NA** ☐				

	Source Reduction Activities (Enter code(s))	Methods to Identify Activity (Enter code(s))			Estimated annual reduction (Enter code(s)) (optional)
8.10.1		**a.**	**b.**	**c.**	**d.**
8.10.2		**a.**	**b.**	**c.**	**d.**
8.10.3		**a.**	**b.**	**c.**	**d.**
8.10.4		**a.**	**b.**	**c.**	**d.**

*For Dioxin or Dioxin-like compounds, report in grams/year.

**Includes quantities released to the environment or transferred off-site as a result of remedial actions, catastrophic events, or other one-time events not associated with production processes

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FORM R Part II. CHEMICAL-SPECIFIC INFORMATION (CONTINUED)	TRI Facility ID Number Toxic Chemical, Category, or Generic Name

SECTION 8.11. DISPOSAL OR OTHER RELEASES, SOURCE REDUCTION, AND RECYCLING ACTIVITIES

8.11	If you wish to submit additional optional information on source reduction, recycling, or pollution control activities, provide it here.

SECTION 9. MISCELLANEOUS INFORMATION

9.1	If you wish to submit any miscellaneous, additional, or optional information regarding your Form R submission, provide it here.